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Madathodiyil et al.

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(54) **VOLUME CUSTOMIZATION**

(75) Inventors: **Baburaj Madathodiyil**, Chennai (IN); **Saleem S. Mohammed**, Chennai (IN); **Vijay Senthil**, Chennai (IN); **Vinodkrishnan Surianarayanan**, Chennai (IN); **Sampath Raman**, Tirunelveli (IN); **Venkatesan Sriraman**, Chennai (IN)

(73) Assignee: **Verizon Patent and Licensing Inc.**, Basking Ridge, NJ (US)

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(51) **Int. Cl.**

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H04N 21/443	(2011.01)
H04N 21/475	(2011.01)
H04N 21/6547	(2011.01)
H04N 21/658	(2011.01)
H04N 5/44	(2011.01)

(52) **U.S. Cl.**

CPC ***H04N 21/4852*** (2013.01); ***H04N 21/25891*** (2013.01); ***H04N 21/443*** (2013.01); ***H04N 21/4751*** (2013.01); ***H04N 21/6547*** (2013.01); ***H04N 21/6582*** (2013.01); *H04N 2005/4407* (2013.01); *H04N 2005/4435* (2013.01)

(58) **Field of Classification Search**

USPC 348/563

See application file for complete search history.

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Primary Examiner — Jefferey Harold
Assistant Examiner — Justin Sanders

(57) **ABSTRACT**

A method may include identify an application launched in a device by a user or a program or a channel selected by the user for playing. The method may further include querying a database to determine whether the application, program, or channel is associated with preset volume settings, wherein the database includes information identifying preset volume settings for a plurality of applications, a plurality of programs, or a plurality of channels. The method may include setting, when the application, program, or channel is associated with preset volume settings, the volume according the preset volume settings during execution of the application or playing of the program or channel. The method may also include prompting the user to set volume settings associated with the application, program, or channel when the application is not associated with the preset volume settings.

20 Claims, 13 Drawing Sheets

VOLUME RULE TABLE 500-1

PROFILE 502	JOHN SMITH
APPLICATION 504	DOOM
CONTENT NAME 505	-
TIME 506	-
DAY 508	-
CHANNEL 510	-
LOCATION 512	-
GENRE 514	-
URL 516	-

SNR 518	-
FREQUENCY BAND 520	-
DISTANCE 522	-
OUTPUT DEVICE 524	SPEAKER 259
CALLER LOCATION 526	-
USERS PRESENT 528	-
AMBIENT NOISE 530	-
AMBIENT LIGHT 532	-
PRIORITY 533	-

VOLUME 534	50%
MAXIMUM VOLUME 536	70%
EQUALIZATION 538	-

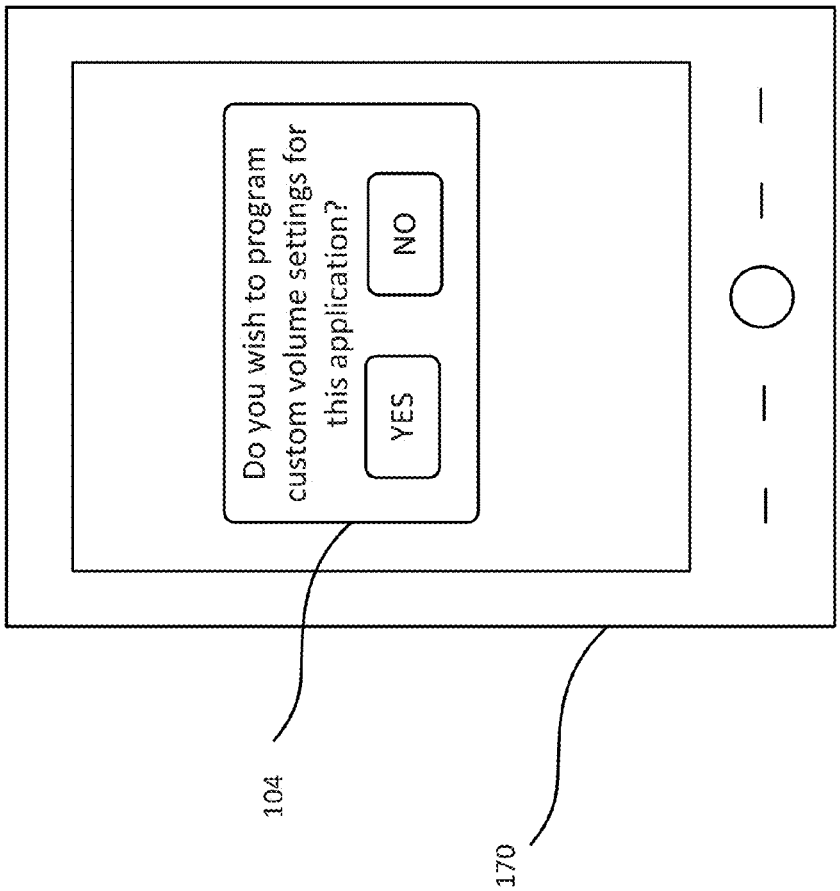

Do you wish to program custom volume settings for this application?
YES
NO
104
170

FIG. 1A

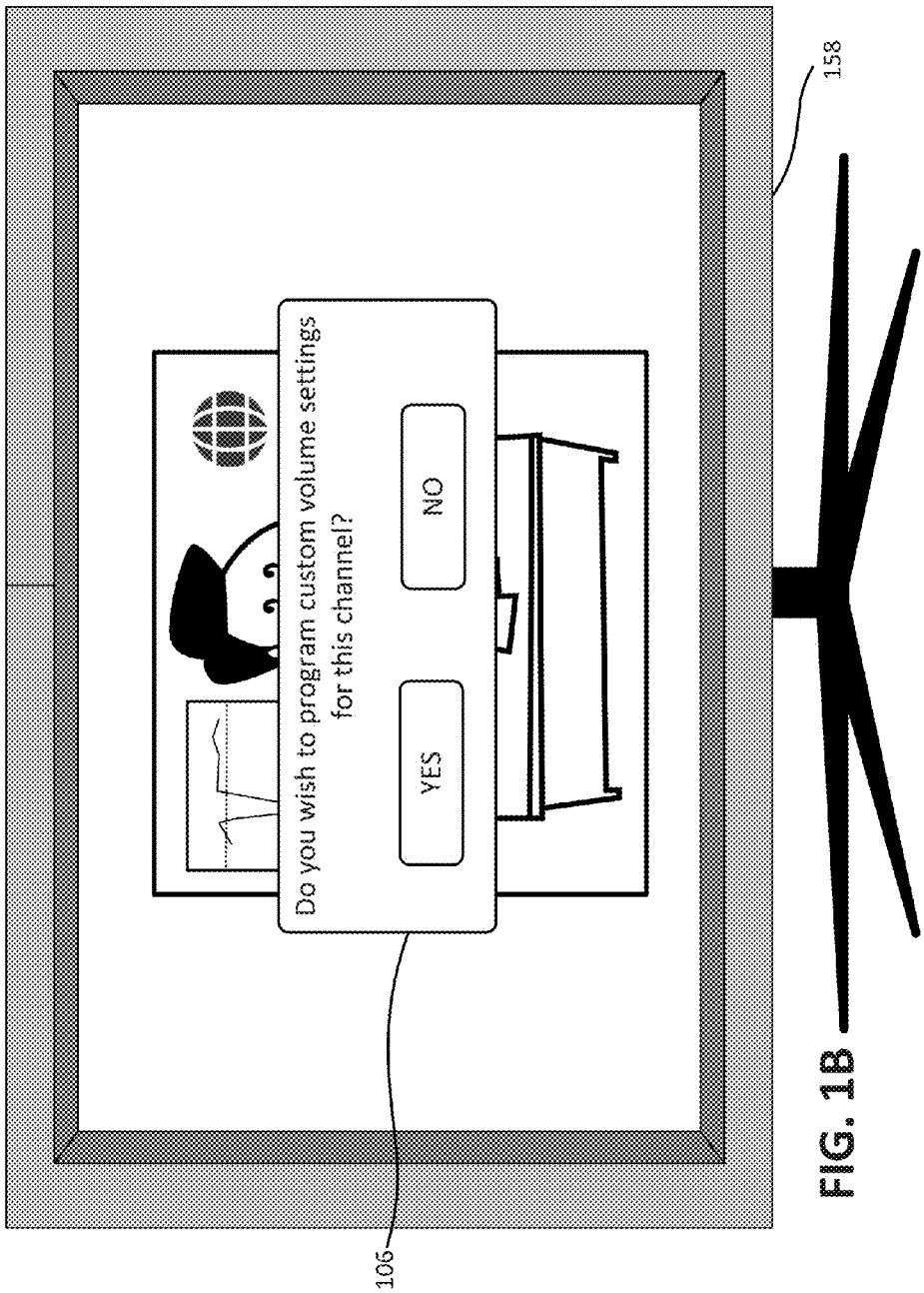

158
Do you wish to program custom volume settings for this channel?
YES
NO
106

FIG. 1B

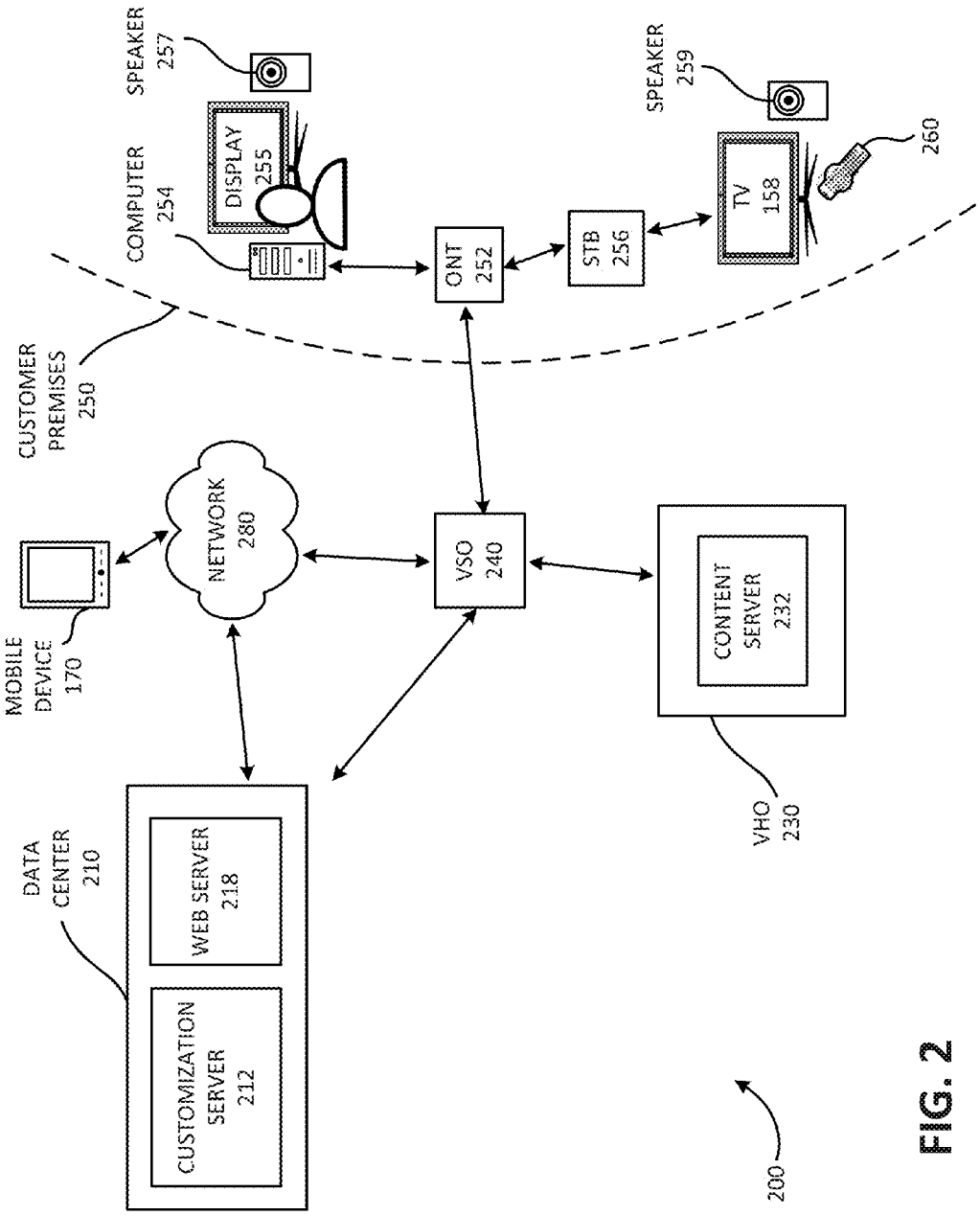

SPEAKER 257
COMPUTER 254
DISPLAY 255
SPEAKER 259
260
TV 158
STB 256
ONT 252
CUSTOMER PREMISES 250
NETWORK 280
VSO 240
CONTENT SERVER 232
MOBILE DEVICE 170
DATA CENTER 210
WEB SERVER 218
CUSTOMIZATION SERVER 212
VHO 230
200

FIG. 2

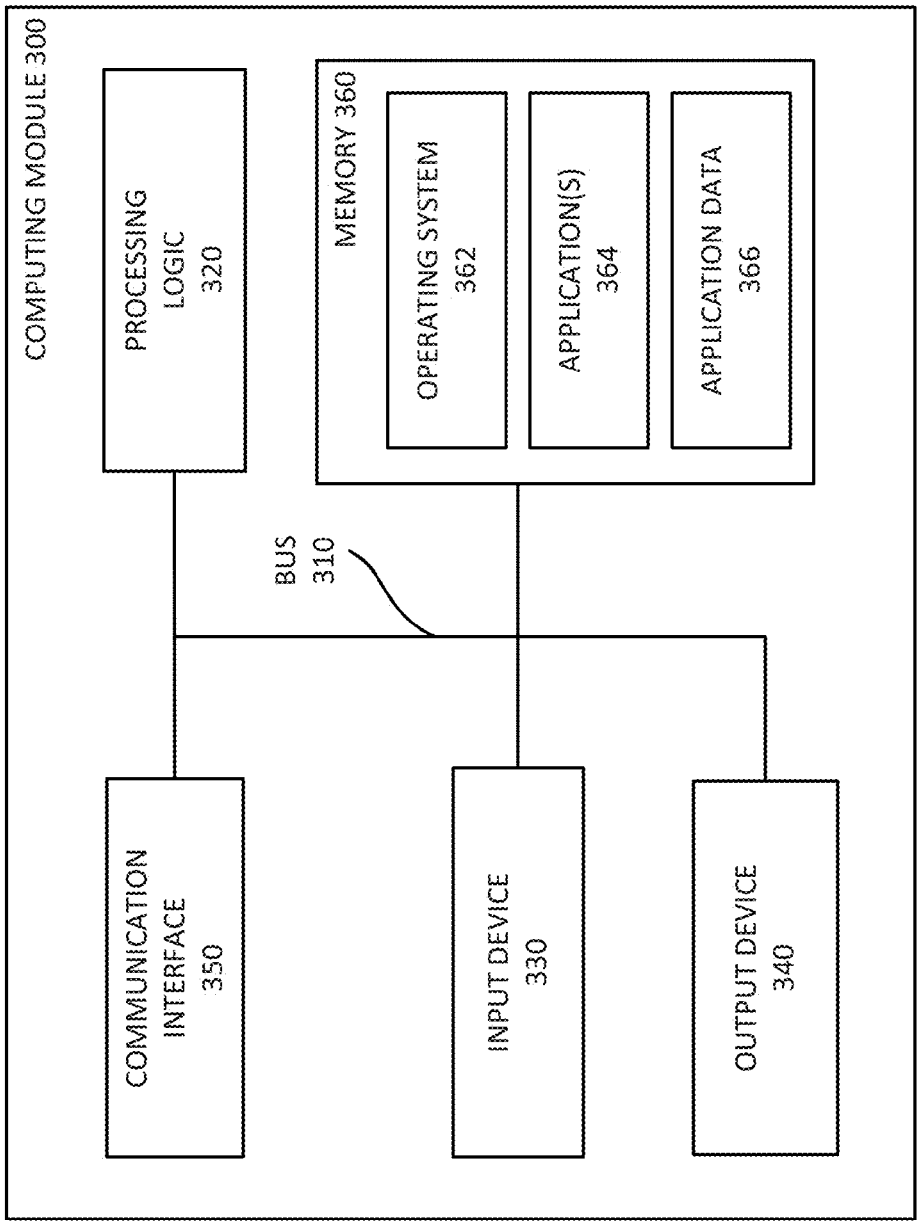

COMPUTING MODULE 300
PROCESSING LOGIC 320
MEMORY 360
OPERATING SYSTEM 362
APPLICATION(S) 364
APPLICATION DATA 366
BUS 310
COMMUNICATION INTERFACE 350
INPUT DEVICE 330
OUTPUT DEVICE 340

FIG. 3

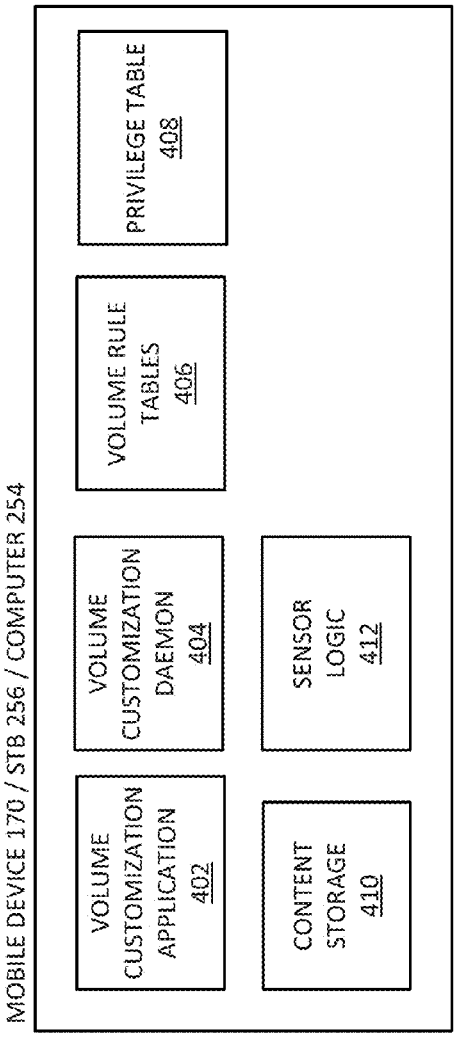

MOBILE DEVICE 170 / STB 256 / COMPUTER 254
VOLUME CUSTOMIZATION APPLICATION 402
VOLUME CUSTOMIZATION DAEMON 404
VOLUME RULE TABLES 406
PRIVILEGE TABLE 408
CONTENT STORAGE 410
SENSOR LOGIC 412

FIG. 4A

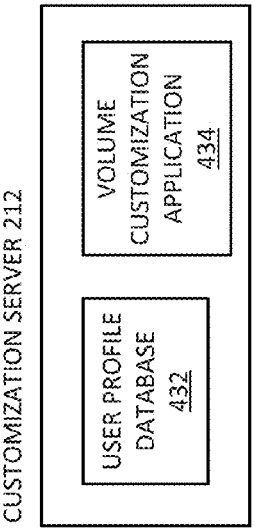

CUSTOMIZATION SERVER 212
USER PROFILE DATABASE 432
VOLUME CUSTOMIZATION APPLICATION 434

FIG. 4B

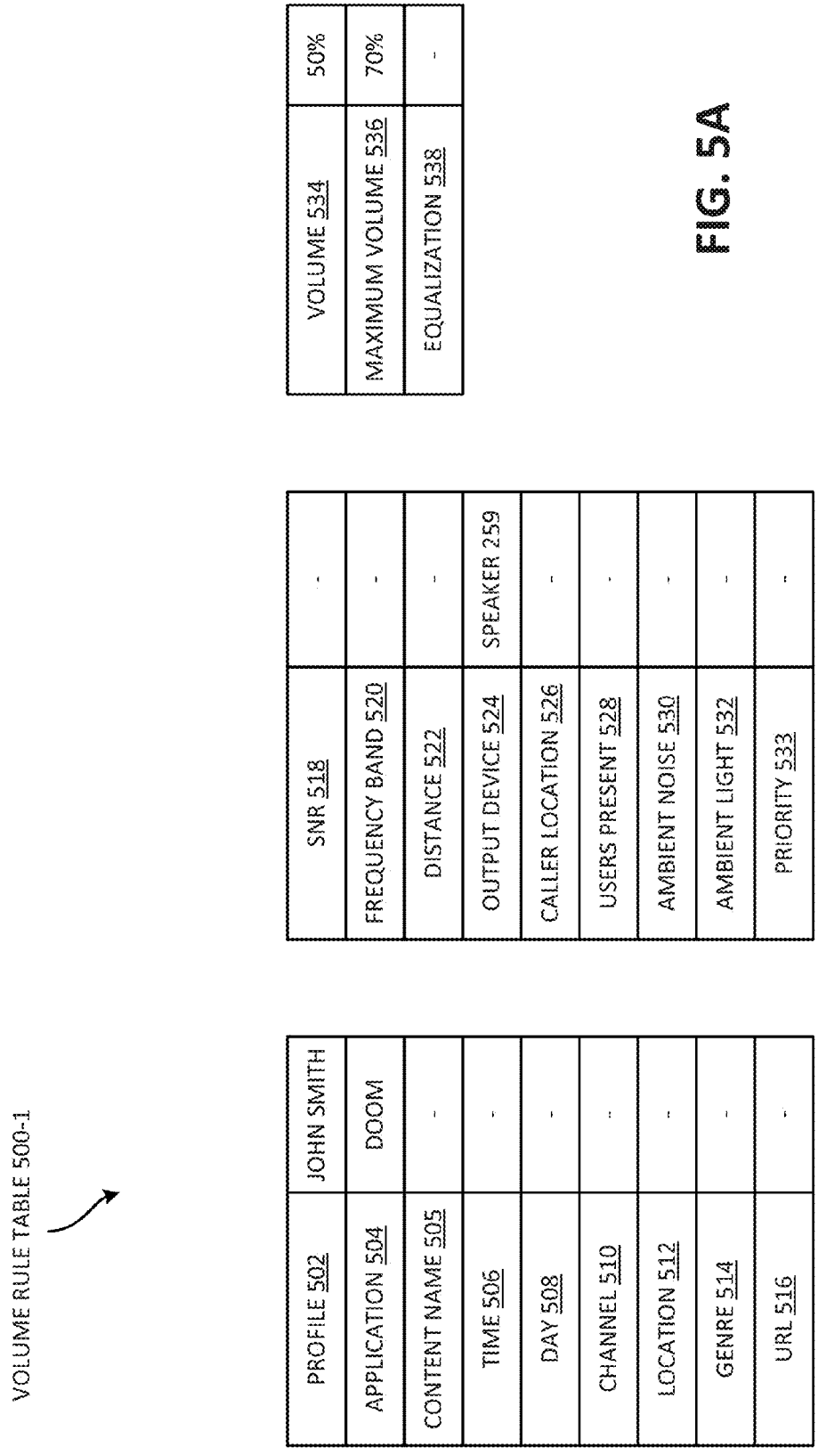

VOLUME RULE TABLE 500-1
PROFILE 502
JOHN SMITH
APPLICATION 504
DOOM
CONTENT NAME 505
TIME 506
DAY 508
CHANNEL 510
LOCATION 512
GENRE 514
URL 516
SNR 518
FREQUENCY BAND 520
DISTANCE 522
OUTPUT DEVICE 524
SPEAKER 259
CALLER LOCATION 526
USERS PRESENT 528
AMBIENT NOISE 530
AMBIENT LIGHT 532
PRIORITY 533
VOLUME 534
50%
MAXIMUM VOLUME 536
70%
EQUALIZATION 538

FIG. 5A

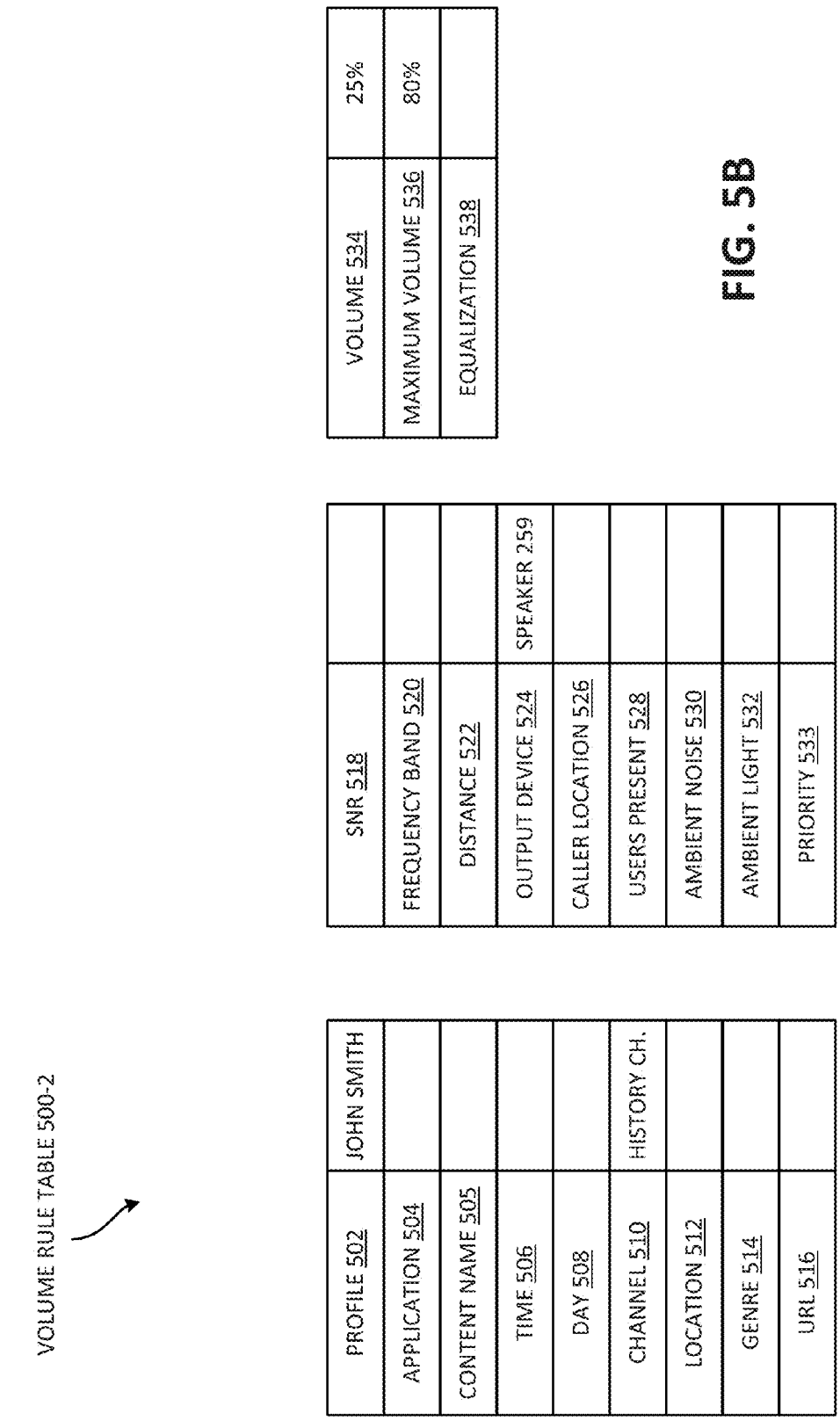

VOLUME RULE TABLE 500-2
PROFILE 502
JOHN SMITH
APPLICATION 504
CONTENT NAME 505
TIME 506
DAY 508
CHANNEL 510
HISTORY CH.
LOCATION 512
GENRE 514
URL 516
SNR 518
FREQUENCY BAND 520
DISTANCE 522
OUTPUT DEVICE 524
SPEAKER 259
CALLER LOCATION 526
USERS PRESENT 528
AMBIENT NOISE 530
AMBIENT LIGHT 532
PRIORITY 533
VOLUME 534
25%
MAXIMUM VOLUME 536
80%
EQUALIZATION 538

FIG. 5B

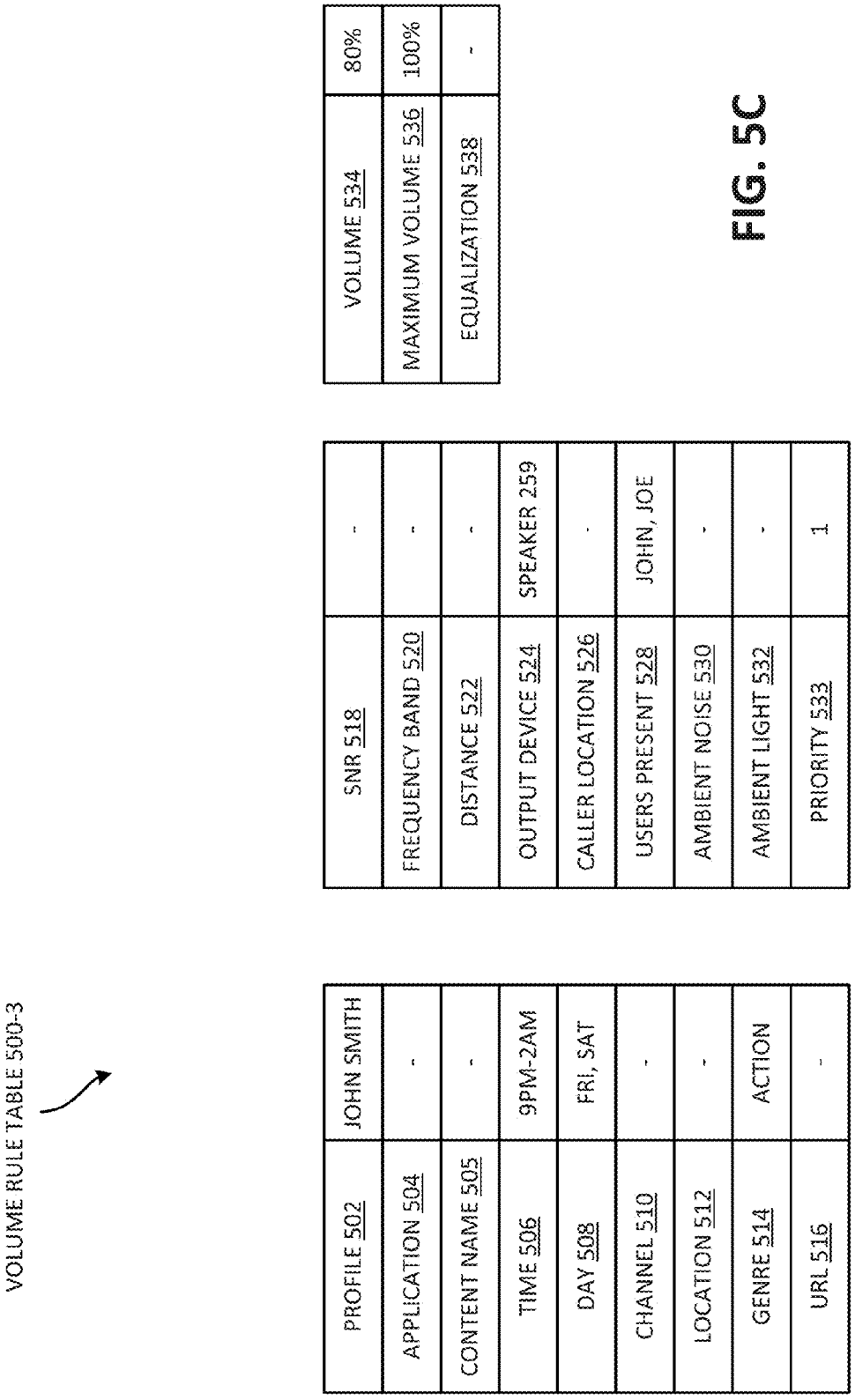
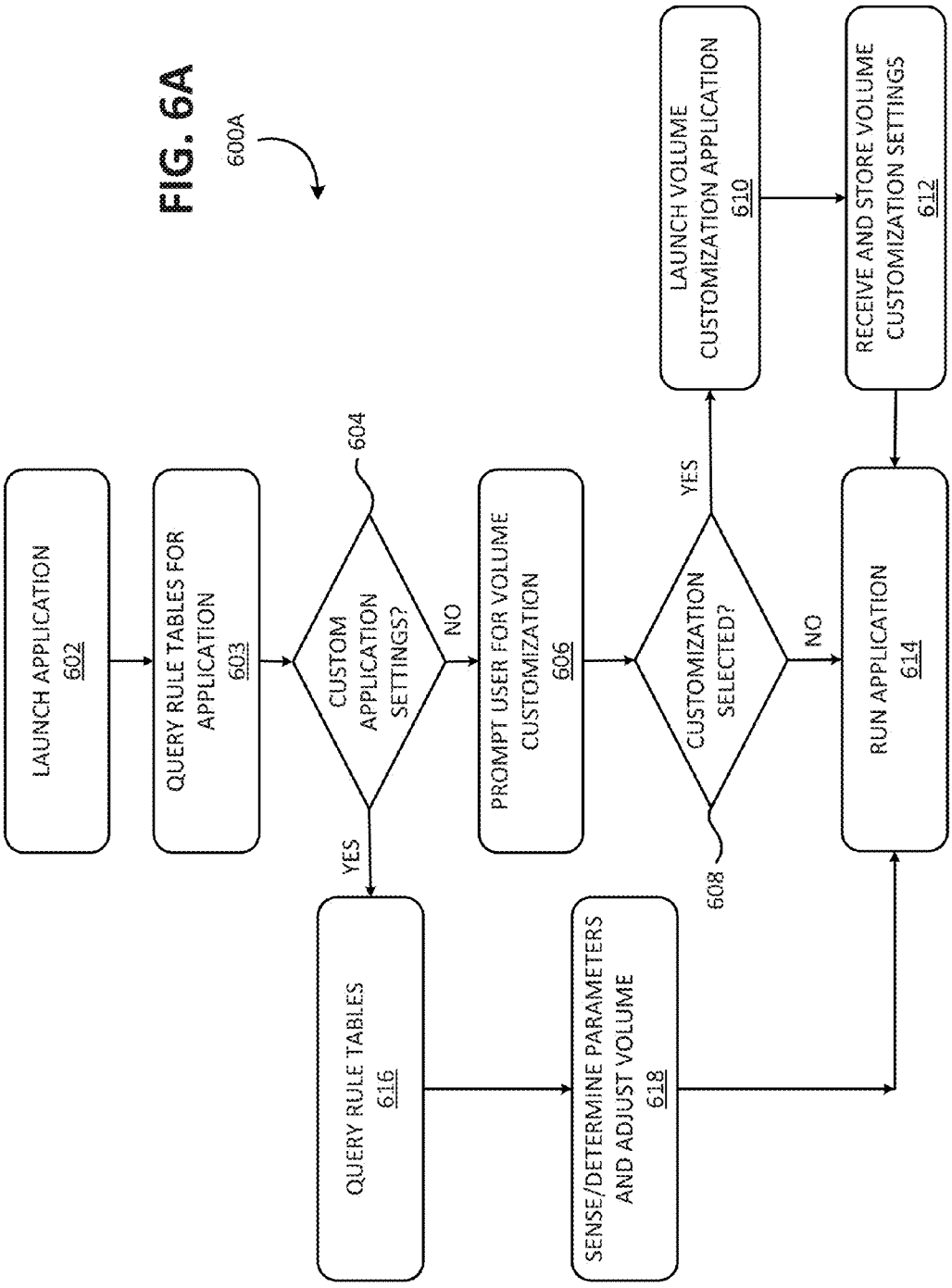

VOLUME RULE TABLE 500-3
PROFILE 502
JOHN SMITH
APPLICATION 504
-
CONTENT NAME 505
-
TIME 506
9PM-2AM
DAY 508
FRI, SAT
CHANNEL 510
-
LOCATION 512
-
GENRE 514
ACTION
URL 516
-
SNR 518
-
FREQUENCY BAND 520
-
DISTANCE 522
-
OUTPUT DEVICE 524
SPEAKER 259
CALLER LOCATION 526
-
USERS PRESENT 528
JOHN, JOE
AMBIENT NOISE 530
-
AMBIENT LIGHT 532
-
PRIORITY 533
1
VOLUME 534
80%
MAXIMUM VOLUME 536
100%
EQUALIZATION 538
-

FIG. 5C

FIG. 6A


600A
LAUNCH APPLICATION
602
QUERY RULE TABLES FOR APPLICATION
603
CUSTOM APPLICATION SETTINGS?
604
YES
NO
QUERY RULE TABLES
616
SENSE/DETERMINE PARAMETERS AND ADJUST VOLUME
618
PROMPT USER FOR VOLUME CUSTOMIZATION
606
CUSTOMIZATION SELECTED?
608
YES
NO
LAUNCH VOLUME CUSTOMIZATION APPLICATION
610
RECEIVE AND STORE VOLUME CUSTOMIZATION SETTINGS
612
RUN APPLICATION
614

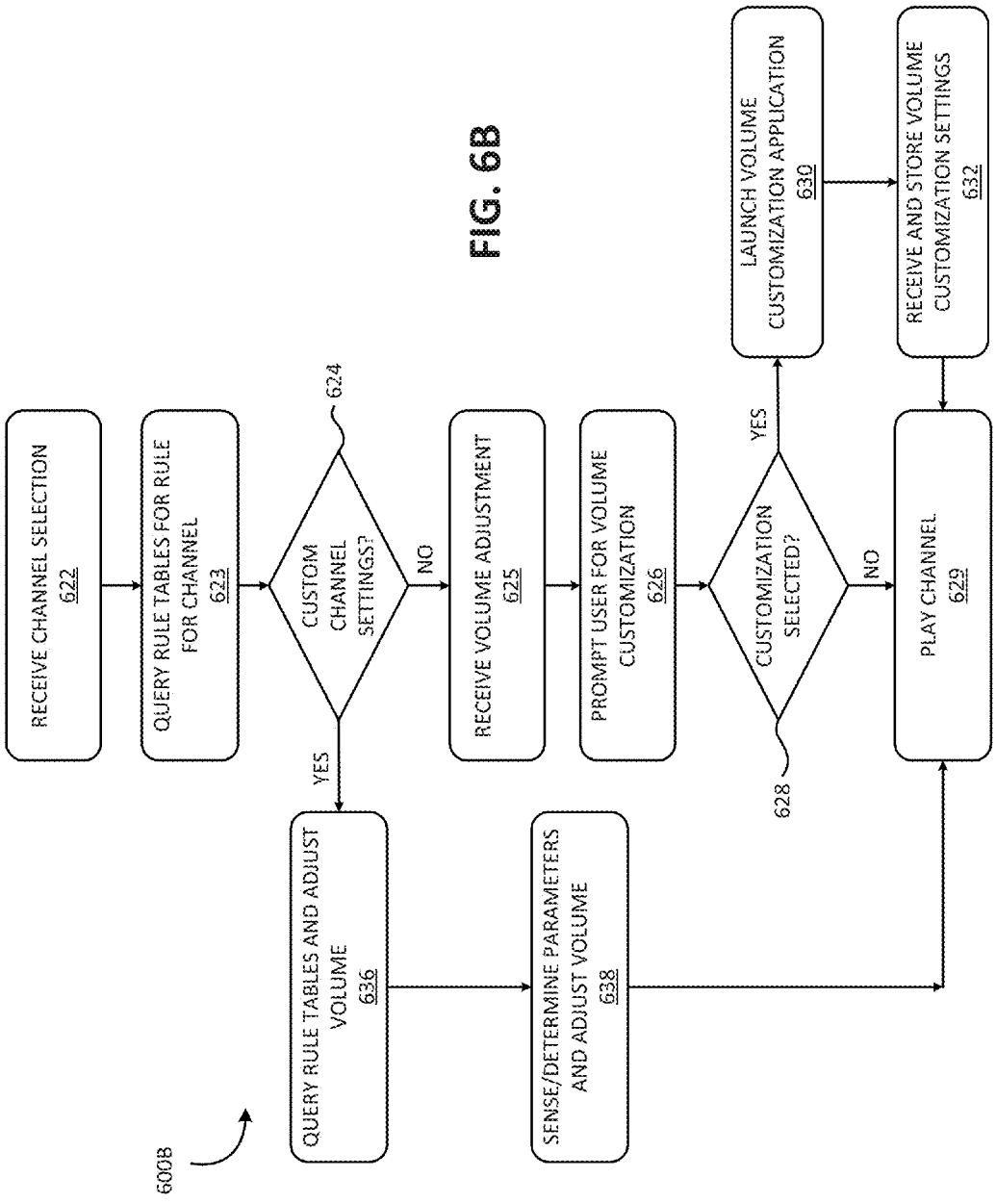

600B
RECEIVE CHANNEL SELECTION 622
QUERY RULE TABLES FOR RULE FOR CHANNEL 623
CUSTOM CHANNEL SETTINGS? 624
YES
NO
QUERY RULE TABLES AND ADJUST VOLUME 636
SENSE/DETERMINE PARAMETERS AND ADJUST VOLUME 638
RECEIVE VOLUME ADJUSTMENT 625
PROMPT USER FOR VOLUME CUSTOMIZATION 626
CUSTOMIZATION SELECTED? 628
YES
NO
LAUNCH VOLUME CUSTOMIZATION APPLICATION 630
RECEIVE AND STORE VOLUME CUSTOMIZATION SETTINGS 632
PLAY CHANNEL 629

FIG. 6B

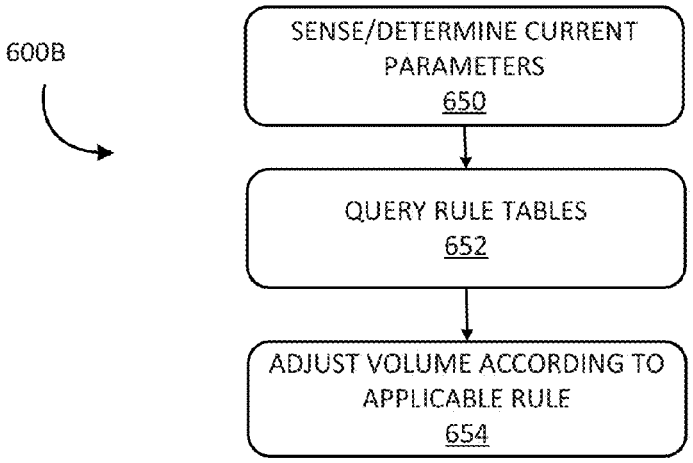

600B
SENSE/DETERMINE CURRENT PARAMETERS
650
QUERY RULE TABLES
652
ADJUST VOLUME ACCORDING TO APPLICABLE RULE
654

FIG. 6C

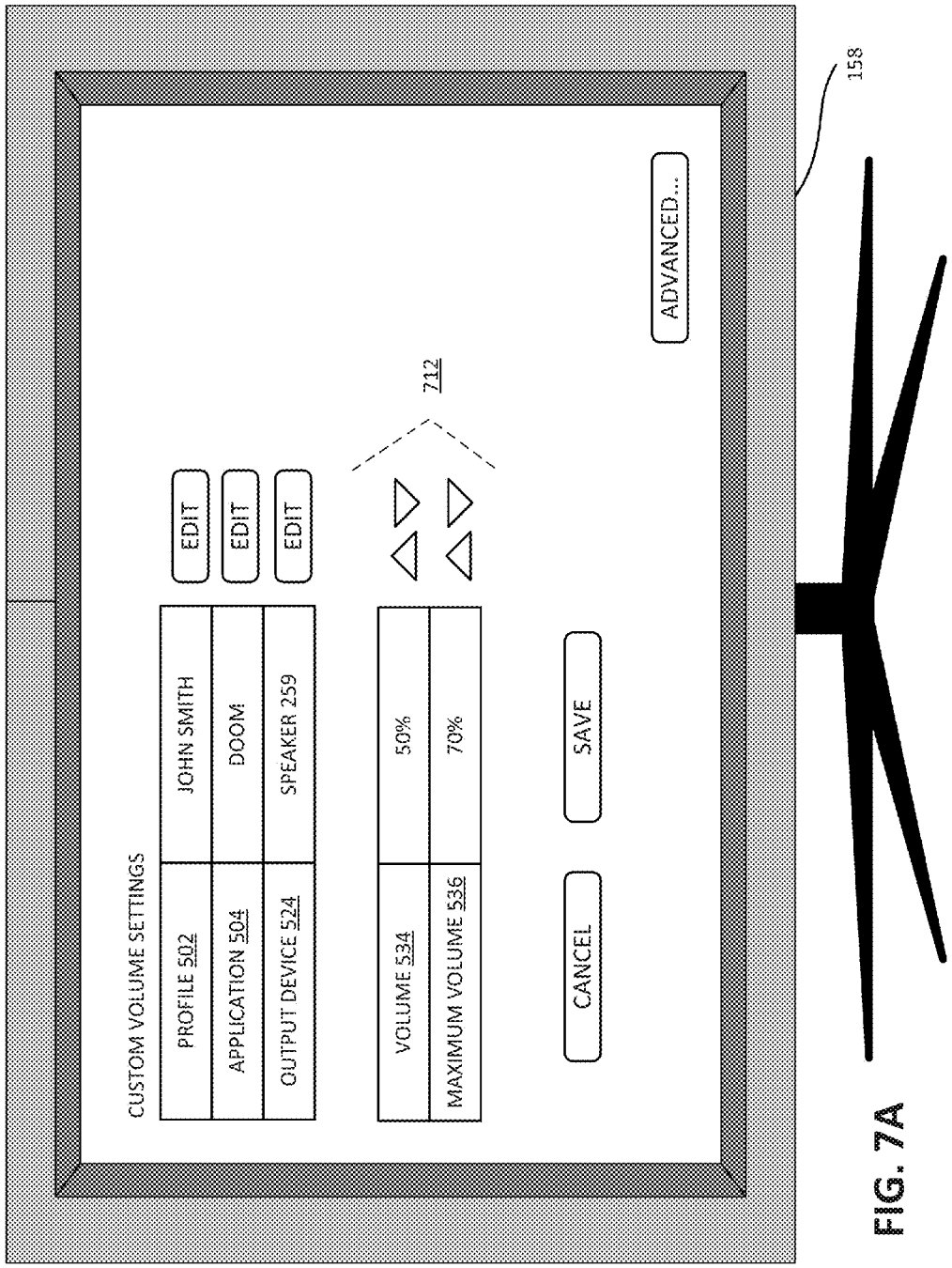

158
CUSTOM VOLUME SETTINGS
PROFILE 502
JOHN SMITH
EDIT
APPLICATION 504
DOOM
EDIT
OUTPUT DEVICE 524
SPEAKER 259
EDIT
712
VOLUME 534
50%
MAXIMUM VOLUME 536
70%
CANCEL
SAVE
ADVANCED...

FIG. 7A

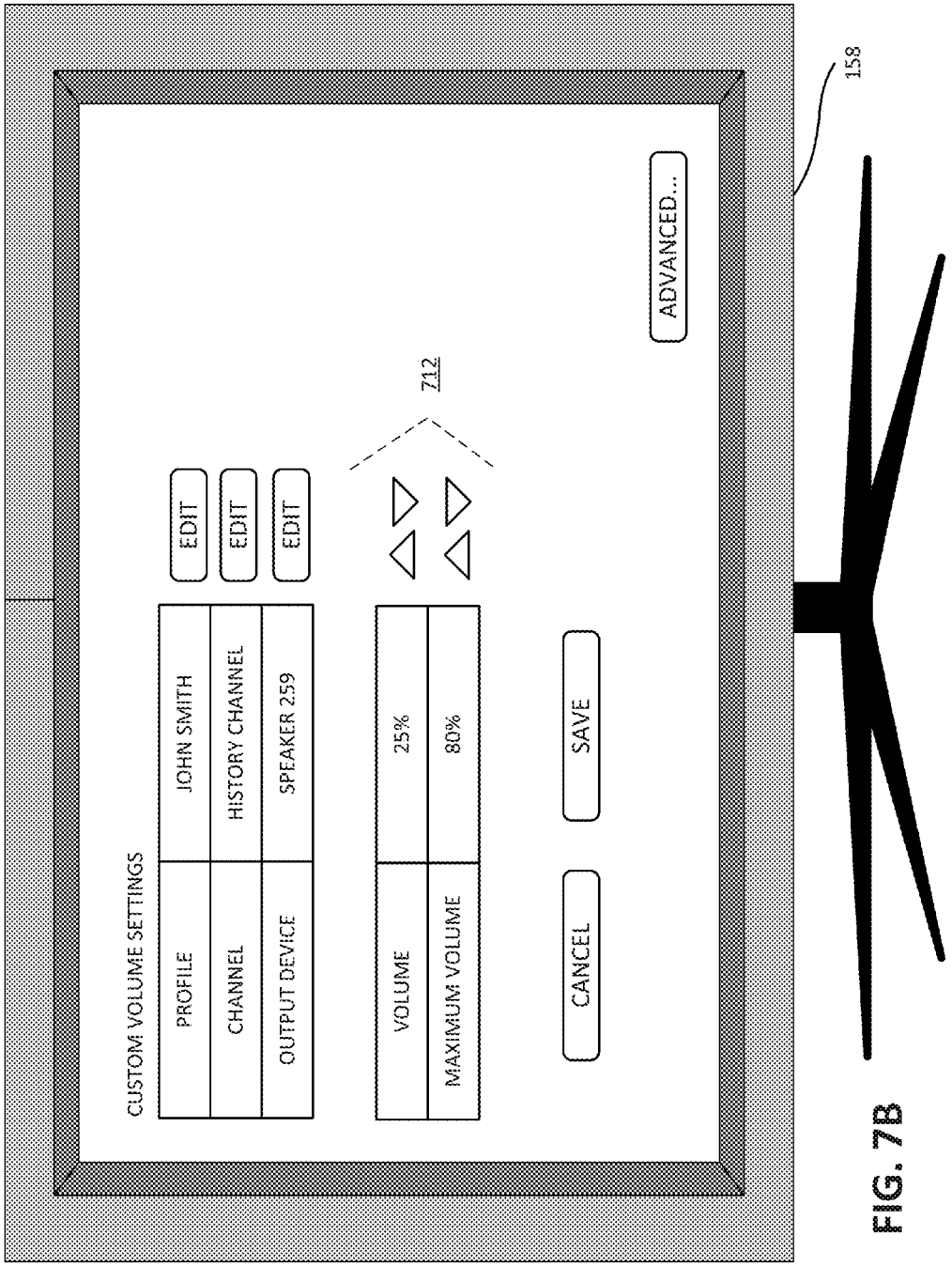

158
CUSTOM VOLUME SETTINGS
PROFILE
JOHN SMITH
EDIT
CHANNEL
HISTORY CHANNEL
EDIT
OUTPUT DEVICE
SPEAKER 259
EDIT
712
VOLUME
25%
MAXIMUM VOLUME
80%
CANCEL
SAVE
ADVANCED...

FIG. 7B

VOLUME CUSTOMIZATION

BACKGROUND INFORMATION

Televisions and device applications typically allow a user to control the volume of audio associated with the television or application. For example, televisions and applications may allow for the volume to be increased or decreased. The control provided by the televisions and applications is limited.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1**A and **1**B illustrate overviews of embodiments for customizing volume settings;

FIG. **2** is a diagram of an exemplary network for implementing the embodiments of FIGS. **1**A and **1**B and other embodiments for customizing volume settings;

FIG. **3** is a block diagram of exemplary components of a computing module implemented in the devices of FIG. **2**;

FIG. **4**A is a block diagram of exemplary components of the mobile device, set-top-box, or computer of FIG. **2**;

FIG. **4**B is a block diagram of exemplary components of the customization server FIG. **2**;

FIGS. **5**A, **5**B, and **5**C are a diagrams of an exemplary volume rule table stored in the set-top box, mobile device, or computer of FIG. **2**;

FIGS. **6**A, **6**B, and **6**C are flowcharts of exemplary processes for the customization of volume controls; and

FIGS. **7**A and **7**B illustrate a television in an example.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The following detailed description refers to the accompanying drawings. The same reference numbers in different drawings may identify the same or similar elements. Also, the following detailed description is exemplary and explanatory only and is not restrictive of the invention, as claimed.

Embodiments disclosed herein allow for a user to customize volume settings in a mobile device, a set-top-box, a TV, a computer, etc. For example, FIGS. **1**A and **1**B illustrate embodiments in which a user is given the opportunity to customize volume settings when launching an application or viewing a channel. As shown in FIG. **1**A, a mobile device **170** displays a dialog box **104** when the user launches an application. The user may program custom volume settings to apply to the application whenever it is executed. As shown in FIG. **1**B, TV **158** displays a dialog box **106** when the user is watching a TV channel. The user may program custom volume settings to apply to the channel when the channel is being watched. The customizations may include the time of day, day of week, people present, ambient noise, ambient light, etc. The customizations may be extended in situations other than launched applications or television channels.

FIG. **2** is a diagram of an exemplary network **200** for implementing the embodiment of FIG. **1** and other embodiments. Network **200** may include a data center **210**, a video hub office (VHO) **230**, a video service office (VSO) **240**, customer premises **250**, mobile device **170**, and a network **280**. VSO **240**, VHO **230**, data center **210**, and other devices in network **200** may form part of a high-speed fiber optic network.

Customer premises **250** (e.g., a customer's home) may include an optical network terminal (ONT) **252**, a personal computer **254**, a set-top box (STB) **256**, a television **158**, an a remote control **260**. Devices in customer premises **250** may include one or more computers for hosting programs, such as

a program for a user to customize volume settings for applications, programs, or channels. Devices in customer premises **250** and mobile device **170** may be considered "user devices" or "network devices."

ONT **252** may receive data, e.g., on a fiber optic cable, and may transmit data to the appropriate device in customer premises **250**, such as computer **254** or STB **256**. Likewise, ONT **252** may receive data from any device in customer premises **250** and may transmit the data to other devices in network **200**, e.g., through a fiber optic cable. ONT **252** may provide customer premises **250** with Internet access, television access, or telephone service, for example. In one implementation, network **200** may include a cable modem in customer premises **250** for receiving and transmitting data rather than an optical network terminal.

Computer **254** may include a laptop, a desktop, a tablet computer, a mobile telephone, or another computation and/or communication device. Computer **254** may include a microphone for capturing audio and/or a camera for capturing images or video. Computer **254** may also include a display **255** for showing images or video or a speaker **257** for playing audio. Computer **254** may connect to network **280** (e.g., the Internet) through ONT **252** and VSO **240**, for example. Computer **254** may interact with data center **210** to provide a user with the ability to view content, download and run applications, and program customized volume settings. For example, personal computer **254** may provide the user with a browser.

STB **256** may receive content and output the content to TV **158** for display. STB **256** may include a component (e.g., a cable card or a software application) that interfaces with (e.g., plugs into) a host device (e.g., a personal computer, TV **158**, a stereo system, etc.) and allows the host device to display content. STB **256** may also be implemented as a home theater personal computer (HTPC), an optical disk player (e.g., digital video disk (DVD) or Blu-Ray™ disc player), a cable card, etc. STB **256** may receive commands or data from other devices in network **200**, such as remote control **260**, and may transmit data to other devices in network **200** (e.g., to data center **210**).

TV **158** may output content received from STB **256**, for example. TV **158** may include speakers as well as a display (e.g., display **102** of FIG. **1**). Remote control **260** may issue wired or wireless commands for controlling other electronic devices, such as TV **158** or STB **256**. Remote control **260**, in conjunction with STB **256**, may allow a user to interact with an application running on STB **256**, such as an application to view content or program custom volume settings. Remote control **260** may allow the user to control the volume of content being viewed on TV **158**. Other types of devices (e.g., a keyboard, mouse, mobile phone, etc.) may be used instead of remote control **260**.

Customer premises **250** may connect to VSO **240**. VSO **240** may deliver content to customer premises **250** and may receive data from customer premises **250** for forwarding to the proper destination (e.g., data center **210**). VSO **240** may include a server for transcoding and multiplexing content from different sources for delivery to customer premises **250**.

VHO **230** may include a content server **232**. Content server **232** may store and provide come (e.g., including on-demand programs). Content server **232** may also include a catalog of programs for a user to browse and select. Content Server **232** may also provide content from national broadcast channels, for example.

Network **280** may include one or more packet switched networks, such as an Internet protocol (IP) based network, a local area network (LAN), a wide area network (WAN), a personal area network (PAN), an intranet, the Internet, a

cellular network, a fiber-optic network, or another type of network that is capable of transmitting data. Network **280**, in conjunction with devices in network **200** (e.g., VSO **240**), may allow user devices (e.g., computer **254**, STB **256**, TV **158**, or mobile device **170**) to connect to other devices also attached to network **280**.

Mobile device **170** may include a mobile phone, a tablet computer, a laptop, or another portable communication device. In one embodiment, mobile device **170** may download and run applications, including applications from Apple's™ App Store, Amazon's™ Application store for Android or Kindle devices, Google's Marketplace for Android devices, Verizon's Application store for Android devices, etc. In one embodiment, mobile device **170** may include a standards-compliant web browser that can execute JavaScript, HTML5, etc.

Data center **210** may include one or more servers (e.g., "network devices") that manage and/or store programs and data associated with allowing users to experience content. As shown in FIG. **2**, data center **210** may include a customization server **212** and a web server **218**. Devices in data center **210** may include one or more computers for hosting programs, such as a web server (e.g., Apache), a database (e.g., MySQL), or other applications,

Customization server **212** may include a database or server that stores information about user preferences, custom volume settings, or other information associated with a user. For example, customization server **212** may store lists of users and their associations with each other (e.g., parents, children, friends, family, classmates, etc.).

Web server **218** may allow for a user to interface with customization server **212** for programming volume customization rules, for example. Web server **218** may also function as a back-end server to coordinate communications between user devices and customization server **212**.

The exemplary configuration of devices in network **200** is illustrated for simplicity. Network **200** may include more devices, fewer devices, or a different configuration of devices than illustrated in FIG. **2**. For example, network **200** may include thousands or millions of customer premises. In some embodiments, the functions performed by two or more devices may be performed by any one device. Likewise, in some embodiments, the functions performed by any one device may be performed by multiple devices. Further, the connections shown in FIG. **2** are exemplary. In other embodiments, additional connections that are not shown in FIG. **2** may exist between devices each device may be connected to every other device). The connections in FIG. **2** may also be wireless or wired.

Devices in network **200** may each include one or more computing modules. FIG. **3** is a block diagram of exemplary components of a computing module **300**. Computing module **300** may include a bus **310**, processing logic **320**, an input device **330**, an output device **340**, a communication interface **350**, and a memory **360**. Computing module **300** may include other components (not shown) that aid in receiving, transmitting, and/or processing data. Moreover, other configurations of components in computing module **300** are possible.

Bus **310** may include a path that permits communication among the components of computing module **300**. Processing logic **320** may include any type of processor or microprocessor (or families of processors or microprocessors) that interprets and executes instructions. In other embodiments, processing logic **320** may include an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA), etc.

Input device **330** may receive information from, for example, a keyboard, a mouse, a pen, a microphone, a remote control (e.g., remote control **260**), an audio capture device, an image and/or video capture device, a touch-screen display, etc. Some devices in network **200**, such as servers in data center **210**, may be managed remote (e.g., are "headless") and may not include a keyboard, a mouse, a microphone, etc.

Output device **340** may output information to the user. Output device **340** may include a display, a speaker, etc. For example, computer **254** may include speaker **257** to output audio to the user. STB **256** and/or TV **158** may be associated with a speaker **259** to output audio of programs being played on TV **158**. As another example, TV **158** and/or personal computer **254** may include a display (an output device), which may include a liquid-crystal display (LCD) for displaying content to the user. For example, computer **254** may include display **255**. As another example, ONT **252** and STB **256** may include light-emitting diodes (LEDs). Headless devices, such as servers in data center **210** may be managed remotely and may not include a display.

Input device **330** and output device **340** may allow a user to activate and interact with a particular service or application, such as a web browser or an application to customize volume settings in applications, programs, or channels. Input device **330** and output device **340** may allow a user to receive and view a menu of options and select from the menu options. The menu may allow the user to select various functions or services associated with applications executed by computing module **300**.

Communication interface **350** may include a transceiver that enables computing module **300** to communicate with other devices or systems. Communication interface **350** may include a transmitter that converts baseband signals to radio frequency (RE) signals or a receiver that converts RF signals to baseband signals. Communication interface **350** may be coupled to an antenna for transmitting and receiving RF signals. Communication interface **350** may include a network interface card, e.g., Ethernet card, for wired communications or a wireless network interface (e.g., a WiFi) card for wireless communications. Communication interface **350** may also include, for example, a universal serial bus (USB) port for communications over a cable, a Bluetooth™ wireless interface, a radio-frequency identification (RFID) interface, a near-field communications (NFC) wireless interface, etc.

Memory **360** may store, among other things, information and instructions (e.g., applications **364** and operating system **362**) and data (e.g., application data **366**) for use by processing logic **320**. Memory **360** may include a random access memory (RAM) or another type of dynamic storage device, a read-only memory (ROM) device or another type of static storage device, and/or some other type of magnetic or optical recording medium and its corresponding drive (e.g., a hard disk drive).

Operating system **362** may include software instructions for managing hardware and software resources of computing module **300**. For example, operating system **362** may include Linux, Solaris, Windows, OS X, iOS, Android, an embedded operating system, etc. Applications **364** and application data **366** may provide network services or include applications, depending on the device in which the particular computing module **300** is found.

Computing module **300** may perform the operations described herein in response to processing logic **320** executing software instructions stored in a computer-readable medium, such as memory **360**. A computer-readable medium may include a physical, logical, and/or non-transitory memory device. The software instructions may be read into

memory **360** from another computer-readable medium or from another device via communication interface **350**. The software instructions stored in memory **360** may cause processing logic **320** to perform processes that are described herein.

As described above with respect to FIG. **2**, STB **256**, computer **254**, and/or mobile device **170** may allow a user to set customize volume settings for applications, channels, programs, time of day, day of week, etc. FIG. **4**A is a block diagram of exemplary components of STB **256**, computer **254**, or mobile device **170** (e.g., functions performed by application **364** executed by processing logic **320** or stored in memory **360** of STB **256**, mobile device **170**, or computer **254**). STB **256**, mobile device **170**, or computer **254** may include a volume customization application **402**, a volume customization daemon **404**, volume rule tables **406**, privilege table **408**, content storage **410**, and/or sensor logic **412**. Mobile device **170**, STB **256**, and computer **254** may include more devices, fewer devices, or a different configuration of devices than illustrated in FIG. **4**A.

Volume customization application **402** may provide the user with an interface to customize the volume for different programs, channels, applications, etc. The volume settings may depend on location, the time of day, the day of week, etc. For example, John Smith may employ volume customization application **402** to customize the volume for programs played on the History Channel. Volume customization application **402** may store customized volume settings in volume rule tables **406**, discussed below. In one embodiment, volume customization application **402** and daemon **404** may include an application purchased or downloaded, for example, from Apple's™ App Store, Amazon's™ Application store for Android or Kindle devices, Google's Marketplace for Android devices, Verizon's Application store for Android devices, etc.

Volume customization daemon **404** is a process or program that runs in the background to implement the volume customization rules stored in volume rule tables **406**. For example, volume customization daemon **404** may sense when a channel is selected (e.g., the History Channel) and adjust the volume according to the rules stored in volume rule tables **406**. Volume customization daemon **404** may use many parameters that relate to rules stored in rule tables **406**. That is, daemon **404** may receive information from sensors in mobile device **170**, STB **256**, and/or computer **254**. In one embodiment, daemon **404** may (e.g., in mobile device **170**) determine the ambient noise conditions, the ambient light conditions, the location of mobile device **170**, the location of a calling party, etc., for the application of rules stored in rule tables **406**.

Volume rule tables **406** stores the conditions, criteria, and volume settings for the customization of the volume for a device, such as mobile device **170**, STB **256**, or computer **254**. FIGS. **5**A-**5**C, discussed below, provide example of volume rule tables **406**. Privilege table **408** may determine which users can edit or manage the volume settings of other users. For example, privilege table **408** may determine that a parent can edit and determine the volume settings of that parent's child.

Content storage **410** may include music, recorded programs, etc., at a user may play on mobile device **170**, STB **256**, and/or computer **254**.

Sensor logic **412** may sense or determine different parameters (e.g., in and around mobile device **170**, STB **256**, or computer **254**). Sensor logic **412** may identify the users watching TV **158**, for example, and their associated profiles (e.g., stored in a user profile database). Sensor logic **412** may use a tight-sensitive diode to determine the ambient light. Sensor logic **412** may use a microphone to determine the ambient sound. Sensor logic **412** may query other processes in mobile device **170**, STB **256**, or computer **254** to determine the time of day, the day of week, the channel currently being played (e.g., by STB **256**), the URL being visited (e.g., by a web browser), or the default audio output device. Sensor logic **412** may query databases to determine the genre of a current program being played, for example,

In one embodiment, sensor logic **412** may determine the users in front of or around TV **158**. In this embodiment, sensor logic **412** may detect REID tags carried by users (e.g., using NFC technology, Bluetooth, etc.) and associated with profiles. In another embodiment, sensor logic **412** may detect hardware addresses associated with wireless devices and associated with user profiles. In another embodiment, sensor logic **412** may use a microphone or a camera and voice/face recognition software (or other biometric devices) to determine the users in front of or nearby TV **158** and their associated profiles. As yet another example, sensor logic **412** may detect users and profiles by virtue of a user "logging in" to an account associated with a profile.

FIG. **4**B is a block diagram of exemplary components of customization server **212** in one embodiment (e.g., functions performed by application **364** executed by processing logic **320** or stored in memory **360** of customization server **212**). Customization server **212** may include user profile database **432** and volume customization application **434**. Customization server **212** may include more, fewer, or a different arrangement of components than illustrated in FIG. **4**B,

Volume customization application **434** may perform many of the same functions described above with respect to volume customization application **402** and/or volume customization daemon **404** in STB **256**, mobile device **170**, or computer **254**. In this embodiment, data center **210** may replace or supplement the functionality of STB **256**, mobile device **170**, or computer **254**. In other words, the logic to determine the volume may be "in the cloud" and provided "over the top" by data center **210** to user devices, such as mobile device **170**.

User profile database **432** may store a database of user profiles. A user profile may store information about a user's preferences (e.g., volume customizations) or other information associated with a user. User profile database **432** may also store a list of other users (e,g., contacts) associated with a particular user (e.g., friends, classmates, followers, family, etc.). User profile database **432** may identify users or groups of users who may be granted permissions to set volume customization settings associated with a particular user (e.g., privilege table **408**). In one embodiment, a user profile may store simply an identification of the user.

FIGS. **5**A, **5**B, and **5**C are diagrams of exemplary volume rule tables **500** (individually "rule table **500**-*x*"). Volume rule tables **500** may store the customized rules for volume control. As shown in FIG. **5**A, rule table **500-1** includes a profile field **502**, an application field **504**, a content name field **505**, a time field **506**, a day field **508**, a channel field **510**, a location field **512**, a genre field **514**, a URL field **516**, a SNR field **518**, a frequency band field **520**, a distance field **522**, an output device **524**, a caller location field **526**, a users present field **528**, an ambient noise field **530**, an ambient light field **532**, a volume field **534**, a maximum volume field **536**, and an equalization field **538**. Rule tables **500** may include fewer, more, or different fields or different data structures than shown in FIG. **5**A.

Fields **502** through **533** express conditions or criteria that when met invoke the volume settings listed in fields **534**-**538**. Rule table **500-1** shows one rule, e.g., one set of criteria and

one set of volume settings. Likewise, rule table **500-2** shows another rule with volume settings, and rule table **500-3** shows another rule with volume setting. Many rule tables defining many different rules are possible.

Profile field **502** identifies the profile(s), person(s), or user account(s) with which the remaining data in table **500-1** is associated. Thus, the rule specified in table **500-1** may only apply when the person associated with profile field **502** is logged into STB **256** or mobile device **170**. For example, a profile field specifying "John" indicates that the information in table **500-1** is associated with the user profile for John Smith.

Application field **504** specifies the application, game, etc., associated with the rule. For example, if application field **504** specifies "Doom," then the volume settings in fields **534-538** would only apply to the sound output from the application named "Doom." Application field **504** may also identify multiple applications or a group of applications for which volume settings in fields **534-538** apply.

Content name field **505** may identify a piece of content by name (e.g., title), number, season number, episode number, etc. For example, if the content name field **505** specified the name "The Simpsons" as the title, then the volume settings in fields **534-538** would only apply to the sound output when a program with that title was played. Content name field **505** may also identify multiple content filenames or a group of content filenames for which volume settings in fields **534-538** apply.

Time field **506** may specify the time for which the volume settings in fields **534-538** apply. For example, time field **506** may specify 12:00 am-8:00 am. In this case, the volume in fields **534-538** would only apply from midnight to 8 in the morning.

Day field **508** may specify the day for which the volume settings in fields **534-538** apply. For example, day field **508** may specify Monday-Friday. In this case, the volume in fields **534-538** would only apply on week days.

Channel field **510** may specify the channel for which the volume settings in fields **534-538** apply. For example, channel field **510** may specify the "History Channel." In this case, the volume in fields **534-538** would only apply for content being played from the History Channel. Channel field **510** may also identify multiple channels or a group of channels for which volume settings in fields **534-538** apply.

Location field **512** may specify the location for which the volume settings in fields **534-538** apply. For example, the location may specify "work," "home," "temple," "church," etc. Thus, for mobile device **170**, the volume settings in fields **534-538** may change depending on the location of the device.

Genre field **514** may specify the genre (e.g., the category of artistic composition) of a program for which the volume settings in fields **534-538** apply. For example, genre field **514** may specify "comedy," "drama," "action," etc. In this case, the volume in fields **534-538** would only apply for content in the "action genre" if genre field **514** specified "action."

URL field **516** may specify the domain for which the volume settings in fields **534-538** apply. For example, URL field **516** may specify "youtube.com." In this case, the volume settings in fields **534-538** would not apply unless the domain from which the volume originated was youtube.com.

SNR field **518** may specify the signal-to-noise ratio (e.g., of the sound being played) for which the volume settings in fields **534-538** apply. For example, fir audio with a high noise component, a user that is hard-of-hearing may specify a higher volume.

Frequency band field **520** may specify the frequencies bands (e.g., of the sound being played) for which the volume settings in fields **534-538** apply. The frequency bands may be specified in Hertz and power. For example, if audio has a lot of power in high frequency bands, then the user may wish for the volume settings to be lower.

Distance field **522** may specify a distance of the listener away from the audio source for which the volume settings in fields **534-538** apply. For example, the farther the listener is away from the audio source, the louder the volume settings may be.

Output device **524** may specify the audio device for which the volume settings in fields **534-538** apply. For example, if the output device includes detached speakers with a sub-woofer, then a different volume setting may be applied than if the output device is only the internal speakers to mobile device **170**.

Caller location field **526** may specify the location of the caller for which the volume settings in fields **534-538** apply. For example, if a caller is located in a public venue (e.g., at a stadium), then the volume settings may be louder so that the person receiving the call can better hear the caller.

Users present field **528** specifies the listeners for which the volume settings in fields **534-538** apply. For example, field **528** may specify "John and Joe." In this case, the specified volume settings in fields **534-538** apply only when John and Joe are present.

Ambient noise field **530** specifies the ambient noise levels for which the volume settings in fields **534-538** apply. For example, in a noisy listening environment, the specified volume may be higher so that the listener can better hear the content being played.

Ambient light field **532** may specify the ambient light conditions for which the volume settings in fields **534-538** apply. For example, in a dark environment, the specified volume may be lower. In a bright environment, the specified volume may be higher.

Priority field **533** specifies which rule to apply if there are multiple rule tables whose conditions or criteria are met. For example, if the conditions in rule table **500-1** are met and the conditions in rule table **500-2** are also met, then the volume settings for the rule table that has the lower priority number will be applied. Priority field may be expressed as a number between 1 and 100 for example.

Volume field **534** specifies the volume to be applied to the applicable audio when the conditions and criteria specified in fields **502-533** are met. The volume may be specified as a percentage of the maximum value e.g., a number between zero (no sound) and 100 (full volume)). The volume may be specified qualitatively (e.g, soft/low, medium/normal, or loud), for example. For example, this volume includes the volume to start an application or channel. The volume may also be expressed as a function based on any one or more of the values stored in fields **502-533**. For example, the volume level may increase steadily as the listener moves away from the audio source (e.g., a function of distance field **522**). The volume may decrease steadily as the light slowly dims (e.g., a function of ambient light field **532**). The volume may increase steadily as the light slowly brightens (e.g., a function of ambient light field **532**). The volume may decrease as a function of time (e.g., a function of time field **506**), etc.

Maximum volume field **536** specifies the maximum volume allowed for the applicable audio when the conditions and criteria specified in fields **502-533** are met. The maximum volume may be specified as a percentage (e.g., a number between zero (no sound) and 100 (full volume)). The maximum volume may be specified qualitatively (e.g., soft/low, medium/normal, or loud), for example. After the volume automatically starts, for example, at the level specified in

volume field **534**, then the user may increase the volume until the maximum volume **536** is reached. The maximum volume may also be expressed as a function (e.g., that varies continuously) of any of the values stored in fields **502-533**.

Equalization field **538** may specify the volume for different audio frequency bands to be applied to the applicable audio when the conditions and criteria specified in fields **502-531** are met. The volume may be specified as a percentage of the maximum volume (e.g., a number between zero (no sound) and 100 (full volume)). The volume may also be specified qualitatively, such as soft/tow, medium/normal, or loud. The frequency band may be specified in Hertz (high and low). Multiple frequency bands may be specified in equalization field **538** (e.g., 0-1000 Hz; 1000-5000 Hz; 5000-10000 Hz; 10000-15000 Hz; 15000-20000 Hz).

As discussed above, volume rule tables **500** may be used for customizing the volume for users. FIGS. **6**A, **6**B, and **6**C are flowcharts of processes **600**A, **600**B, and **600**C for the customization of volume controls. The description of process **600**A includes an example in which the user is a customer named John Smith. In this example, John sits in front of TV **158** at home (e.g., customer premises **250**) and uses remote control **260** to control TV **158** and STB **256**. John uses remote control **260** and STB **256** to surf channels, launch applications, play games, etc. Process **600**A begins with the user instructing STB **256** to launch an application (block **602**). For example, John may select and launch the application named "Doom" (e.g., a game application). In this example, volume customization daemon **404** may sense that the application "Doom" has been launched.

The rule tables may be queried to determine whether the volume settings for the launched application have been programmed (block **603**). In this case, volume customization daemon **404** may query rule tables **500** stored in STB **256**. If there is no rule regarding the launched application (block **604**: NO), then the user may be prompted to determine if the user wishes to customize the volume for the application (block **606**). In this example, it is assumed that table **500-1** in rule tables **500** does not yet exist. As shown in FIG. **1**A, the user may be prompted with a dialog box **104** asking "do you wish to program custom volume settings for this application?" Although dialog **104** is shown in FIG. **1**A as appearing on mobile device **170**, dialog box **104** may also appear on TV **158**. In this example, the user selects "YES" or "NO" using remote control **260**.

If the user does not wish to customize the volume control for the application (e.g., a "NO" selection is received by STB **256**) (block **608**: NO), then the application runs without customizing the volume control for the application (block **614**). In one embodiment, the dialog box is automatically removed if the user does not respond within a certain period of time (e.g., 3, 5, 10, 15, or 30 seconds). During execution of the application (block **614**) (e.g., whether or not customization has been selected), the user may control the volume by using remote control **260**.

If the user does wish to customize the volume control for the application (e.g., a "YES" selection is received by STB **256**) (block **608**: YES), then volume customization application **402** may be launched (block **610**). In this example, as shown in FIG. **7**A, profile field **502**, application field **504**, and output device field **524** may be automatically populated (e.g., for the profile "John Smith," the launched application "Doom," and the default "speaker **259**"). The user may edit these fields by selecting the "EDIT" button using remote control **260**. The user may also program the custom volume settings by selecting the up and/or down arrows **712**. By hitting the SAVE button, the user may save the volume settings. By hitting the ADVANCED button, the user may alter the other settings, such as all those described above with respect to rule tables **500**. The volume customization settings are received and stored by the volume customization application (block **612**). For example, John may enter the volume setting information to be stored in table **500-1**. In this fashion, when the application is launched again (block **602**), then the user may not be prompted to customize the volume settings (e.g., block **606** is no performed). In addition, upon saving the selections, the application will be executed in accordance with the saved information.

If the application already has custom application settings (block **604**: YES), then the appropriate rule table is queried to determine the volume settings for adjusting the volume accordingly (block **616**). For example, when John Smith launches the application "Doom" again then rule table **500-1** includes the custom volume settings for the application. In this case, STB **256** queries rule table **500-1** for the appropriate volume settings (e.g., 50% of the maximum in this example). The appropriate parameters may be sensed or determined (block **618**). For example, a rule for an application may depend on the time of day (time field **506**) or the day of the week (day field **508**). In this case, the current time may be determined for comparison to time field **506** or day field **508**.

The application is allowed to run (block **614**) with, for example, the adjusted volume. During execution of the application (block **614**), the user may still control the volume by using remote control **260** (e.g., within the parameter set by the corresponding rule). In one embodiment, the user may not increase the volume beyond the volume specified in maximum volume field **536**.

FIG. **6**B is a flowchart of an exemplary process **600**B for customizing volume settings while watching a channel. The following description of process **600**B follows the example above in which John Smith sits in front of TV **158** and uses remote control **260** to control TV **158** and STB **256**. Process **600**B begins with the user instructing STB **256** to view a channel (block **622**). For example, John Smith may instruct STB **256** to display the "History Channel." In this embodiment, volume customization daemon **404** may sense that John has selected a channel.

The rule tables may be queried regarding customization for the particular channel (block **623**). Volume customization daemon **404** may query rule tables **500** when the "History Channel" is selected, for example. If there is no rule regarding the channel (block **624**: NO) and a volume adjustment is received (block **625**) (e.g., a volume up or down press on remote control **260**), then the user may be prompted to determine if the user wishes to customize the volume for the channel (block **626**). For example, assuming there is no rule for the "History Channel" yet, while watching the "History Channel," John may press the volume-up button on remote control **260**. In this case, volume customization daemon **404**, may detect the volume-up press and display dialog box **106**, as shown in FIG. **1**B. In another embodiment, rather than waiting for a volume control button to be pressed on remote control **260**, daemon **404** may pause for a period of time before displaying dialog box **106**. In this example, the user selects options "YES" or "NO" using remote control **260**.

If the user does not wish to customize the volume control for the channel (e.g., a "NO" selection is received) (block **628**: NO), then the channel may continue to be played without customizing the volume control for the channel (block **629**). In one embodiment, dialog box **106** may be automatically removed if the user does not respond within a certain period

of time (e.g., 3, 5, 10, 15, or 30 seconds). While the channel is playing (block **629**), the user may still control the volume by using remote control **260**.

If the user does wish to customize the volume control for the channel (e.g., a "YES" selection is received) (block **628**: YES), then volume customization application **402** may be launched (block **630**). As shown in FIG. **7**B, volume customization application **402** displays a user interface for the user to program custom volume settings for the current channel. In this example, channel field **510** may be populated with the current channel (e.g., the "History Channel"). User profile field **502** and output device **524** may also be automatically populated (e.g., "John Smith," and "Speaker **259**"). The user may then add additional conditions by selecting the ADVANCED button. The user may then also add volume control information by selecting the up or down arrows **712** to program volume field **534** and maximum volume field **536**. The volume customization settings are received and stored by the volume customization application (block **632**). In this fashion, when the channel is selected again (block **622**), then the custom volume settings can apply. In addition, upon saving the selections, the channel will be played in accordance with the saved information. In this example, John may save the settings in table **500-2**.

If the channel already has custom volume settings (block **624**: YES), then the appropriate rule table is queried to determine the volume settings for adjusting the volume accordingly (block **636**). For example, the next time John Smith selects the History Channel, he is not prompted and rule table **500-1** is queried for the previously programmed settings. The appropriate parameters may be sensed or determined (block **638**). For example, a rule for an application may depend on the time of day (time field **506**) or the day of the week (day field **508**). In this case, the current time may be determined for comparison to time field **506** or day field **508**.

The channel is allowed to play (block **629**) with, for example, the adjusted volume. While playing the channel (block **629**), the user may still control the volume by using remote control **260**. In one embodiment, the user may not increase the volume beyond the volume specified in maximum volume field **536**.

Process **600**B may also run on a program-basis rather than a channel-basis. For example, using the content name field **505**, process **600**B may receive a program selection, query rule tables **500**, determine whether a rule exists for the selected program, and set the volume accordingly if a rule exists. Otherwise, if a rule does not exist, the user may be prompted for programming a rule for the program.

A user may also launch volume customization application **402** on its own to program or change custom volume settings. In one embodiment, volume customization application **402** queries privileges (e.g., privilege table **408**) associated with a profile of the user. In some cases, a user may not have privileges to edit or change some volume customizations. For example, a profile may be established that disallows or prevents a child from editing the maximum volume setting of a game. Rather, the profile may be set to allow the parent of the child to edit the volume setting of the game.

Volume customization daemon **404** may run process **600**C as a background process (e.g., a process that is always running). Process **600**C may begin with a determination or sensing of parameters that may apply to rules (block **650**). These parameters may be determined by the fields stored in rule tables **500**. For example, daemon **404** may employ sensor logic **412** to determine the current profile of the user (e.g., John Smith). Sensor logic **412** and/or daemon **404** may determine the time of day, the day of the week, etc. Daemon **404** may employ sensor logic **412** to determine the channel that is being watched, for example, by querying other processes in STB **256**. Sensor logic **412** may also determine the program being watched by querying a program guide (e.g., knowing the time, day, and channel), or by information carried in the channel itself. Sensor logic **412** may determine the genre of a program by querying a program guide (e.g., knowing the name of the program). Sensor logic **412** may determine the location of the user, particularly in the case of mobile device **170**. Sensor logic **412** may determine the location of the user by querying location services provided by mobile device **170** (e.g., a GPS device, etc.). Sensor logic **412** may determine the ambient noise by using a microphone built into mobile device **170**, STB **256**, or computer **254**. Sensor logic **412** may determine the ambient light by using a photo-sensitive diode in mobile device **170**, STB **256**, or computer **254**. Sensor logic **412** may determine the URL being visited by the user using a web browser. Sensor logic **412** may determine the output device being used (e.g., speaker **257** or speaker **259**). Sensor logic **412** may determine who is in the room watching TV **158**.

In the following example, sensor logic **412** determines that (1) John Smith is the current profile (e.g., John is logged in), (2) it is 10 p.m. on Friday, (3) an action film is playing on TV **158**, and (4) both John Smith and Joe Smith are present in the room watching TV **158**. Process **600**C may then use the sensed or determined parameters to query rule tables (block **652**) to determine if there are any rules to apply to the current parameters. In the current example, rule table **500-3** applies, based on the information stored in fields **502**, **506**, **508**, **514**, and **528** illustrated in FIG. **5**C. If an applicable rule applies, the volume may be adjusted according to the rule (block **654**). In the current example, rule table **500-3** applies and the volume may be adjusted to 80% of the maximum volume automatically.

If there are multiple rule tables that apply (e.g., conflicting rules), then priority field **533** may determine which rule is implemented. Further, in one embodiment, the parameters (block **650**) may be determined or sensed continuously, on a regular basis (e.g., once every minute or once every 5, 15, 20, 25, 30, 45, or 60 minutes), or in response to certain events. In the current example, daemon **404** may determine that John and Joe are currently watching TV **158**. If Joe leaves the room, then daemon **404** may determine that John is the only person watching TV **158** and may apply a different rule, for example.

Although processes **600**A, **600**B, and **600**C have been described with STB **256**, mobile device **170**, and computer **254** providing the customization functions, as mentioned above, these functions may be performed "in the cloud" by data center **210** (e.g., customization server **212**) and provided "over the top" to a user device, such as STB **256**.

Volume customization program **402** and daemon **404** may also be put into a learning mode. In this mode, sensor logic **412** senses the parameters listed in table **500-1**. Program **402** and daemon **404** also determine the volume set by the users. Program **402** and daemon **404** then may analyze the information and look for patterns. For example, when a particular person is in the room (e.g., in front of STB **258**), the user repeatedly and consistently increase the volume. In this case, when that particular person enters the room, program **402** and daemon **404** may automatically increase the volume. Program **402** and daemon **404** may correlate sensed and determined information (e.g., stored in fields **502-533**) with volume information. When patterns are recognized, then program **402** and daemon **404** may set the volume settings stored in fields **534-538**. For example, if a user always has the

volume turned high when playing music on mobile device **170** (e.g., without external speakers), then this pattern may be learned by program **402** and daemon **404** and settings may be stored in tables **500**. When a user consistently turns up the volume when watching TV **158** from afar, this pattern may be recognized by program **402** and daemon **404** and the appropriate settings may be saved in tables **500**. When a particular game is played with the volume consistently loud, except when the game is played at night, then this pattern may be recognized and the information stored in tables **500**.

As the term is used herein, "program" should be construed to mean any type of content, including music, video, audio, or any combination of audio and video.

In the preceding specification, various preferred embodiments have been described with reference to the accompanying drawings. It will, however, be evident that various modifications and changes may be made thereto, and additional embodiments may be implemented, without departing from the broader scope of the invention as set forth in the claims that follow. The specification and drawings are accordingly to be regarded in an illustrative rather than restrictive sense.

Further, certain portions of the invention may be implemented as logic that performs one or more functions. This logic may include hardware, such as an application specific integrated circuit, a field programmable gate array, a processor, or, a microprocessor, or a combination of hardware and software.

No element, act, or instruction used in the description of the present application should be construed as critical or essential to the invention unless explicitly described as such. Also, as used herein, the article "a" and the term "one of" are intended to include one or more items. Further, the phrase "based on" is intended to mean "based, at least in part, on" unless explicitly stated otherwise.

What is claimed is:

1. A computer-implemented method comprising:

identifying an application launched in a device by a user or identifying a program or a channel selected by the user for playing, wherein the identified application, program, or channel includes audio content;

querying a database, in response to identifying the application, program, or channel, to determine whether the application, program, or channel is associated with a corresponding set of rules, wherein the database stores a set of rules for each of a plurality of applications, programs, or channels, wherein each of the sets of rules is associated with a plurality of conditions and a plurality of preset volume settings corresponding to the plurality of conditions, wherein the plurality of conditions and the plurality of preset volume settings are customizable by the user, and wherein the plurality of preset volume settings associated with a particular application, program, or channel are applied to all audio content played in association with the particular application, program, or channel;

adjusting a volume for playing the audio content, according to the corresponding set of rules, when determined that the identified application, program, or channel is associated with the corresponding set of rules, during execution of the identified application or during the playing of the identified program or channel;

prompting the user to set a new set of rules to associate with the identified application, program, or channel, in response to determining that the identified application, program, or channel is not associated with the corresponding set of rules; and

receiving from the user in response to prompting the user to set the new set of rules, the new set of rules and associating the new set of rules in the database with the identified application, program, or channel.

2. The computer-implemented method of claim **1**, wherein each of the preset volume settings includes a volume level for adjusting the volume of the content included in the corresponding application, program, or channel.

3. The computer-implemented method of claim **2**, wherein each of the preset volume settings includes a maximum volume level above which the volume for playing the audio content included in the application, program, or channel cannot exceed.

4. The computer-implemented method of claim **3**, wherein the user is associated with a profile, the method further comprising:

preventing altering of the maximum volume level by the user based on privileges associated with the profile that prevent altering of the maximum volume level.

5. The computer-implemented method of claim **4**, wherein the user is a first user and the profile is a first profile, the method further comprising:

allowing altering of the maximum volume level by a second user based on privileges associated with a second profile that allow altering of the maximum volume level.

6. The computer-implemented method of claim **1**, wherein each of the sets of rules includes a time frame during which the corresponding preset volume setting applies.

7. The computer-implemented method of claim **1**, wherein identifying the application, program, or channel includes identifying the program selected for playing, wherein the sets of rules corresponding to the selected program includes a genre of programming for which the preset volume setting applies.

8. A device comprising:

a memory to store instructions; and

a processor to execute instructions to:

receive a command initiated by a user to launch an application or to play a channel or a program, wherein the application, channel, or program includes audio content;

query a database, in response to the received command initiated by the user, to determine whether the application, program, or channel is associated with a set of rules, wherein the database stores sets of rules for each of a plurality of applications, programs, or channels, wherein each of the sets of rules is associated with a set of conditions and a plurality of preset volume settings corresponding to the set of conditions, wherein the sets of conditions and the plurality of preset volume settings corresponding to the sets of conditions are customizable by the user, and wherein the plurality of preset volume settings associated with a particular application, program, or channel are applied to all audio content played in association with the particular application, program, or channel;

adjust a volume for playing the audio content, according to a corresponding set of rules, when the processor determines that the application, program, or channel is associated with the corresponding set of rules during execution of the application or playing of the channel or the program; and

prompt the user to set a new set of rules to associate with the application, program, or channel in response to the command initiated by the user, and in response to the application, channel, or program not being associated a corresponding set of rules; and

receive from the user, in response to the prompt, the new set of rules and associate the new set of rules in the database with the application, program, or channel.

9. The device of claim **8**, wherein each of the preset volume settings includes a volume level for adjusting the volume for playing the audio content included in the corresponding the application, program, or channel.

10. The device of claim **9**, wherein each of the preset volume settings includes a maximum volume level above which the volume for playing the audio content included in the corresponding application, program, or channel cannot exceed.

11. The device of claim **10**, wherein the user is associated with a profile, and wherein the processor is configured to prevent altering of the maximum volume level by the user based on privileges associated with the profile that prevent altering of the maximum volume level.

12. The device of claim **11**, wherein the user is a first user and the profile is a first profile, and wherein the processor is configured to allow altering of the maximum volume level by a second user based on privileges associated with a second profile that allow altering of the maximum volume level.

13. The device of claim **8**, wherein each of the sets of rules includes a time frame during which the corresponding preset volume setting applies.

14. The device of claim **8**, wherein the processor receives a selection of the program for playing, and wherein the set of rules corresponding to the selected program includes a genre of programming for which the preset volume setting applies.

15. A non-transitory computer-readable medium comprising instructions for execution by a processor, the instructions including:

one or more instructions to identify an application launched in a device by a user or to identify a program or a channel selected by the user for playing, wherein the identified application, program, or channel includes audio content;

one or more instructions to query a database, in response to the identification of the application, the program, or the channel, to determine whether the application, program, or channel is associated with a corresponding set of rules, wherein the database stores a set of rules for each of a plurality of applications, programs, or channels, wherein each of the sets of rules is associated with a set of conditions and a plurality of preset volume settings corresponding to the set of conditions, wherein the sets of conditions and the plurality of preset volume settings corresponding to the sets of conditions are customizable by the user, and wherein the plurality of preset volume settings associated with a particular application, program, or channel are applied to all audio content played in association with the particular application, program, or channel;

one or more instructions to adjust a volume for playing the audio content, according to the corresponding set of rules, when the application, program, or channel is associated with the corresponding set of rules, during execution of the application or playing of the program or channel; and

one or more instructions to prompt the user to set a new set of rules to associate with the identified application, program, or channel, in response to identification of the application, program, or channel, and in response to the determining that the application, program, or channel, is not associated a set of rules; and

one or more instructions to receive from the user, in response to prompting the user to set the new set of rules, the new set of rules and associate the new set of rules in the database with the identified application, program, or channel.

16. The non-transitory computer-readable medium of claim **15**, wherein each of the preset volume settings includes a volume level for adjusting the volume for playing the audio content included in the corresponding application, program, or channel.

17. The non-transitory computer-readable medium of claim **15**, wherein each of the preset volume settings includes a maximum volume level above which the volume for playing the audio content included in the corresponding application, program, or channel cannot exceed.

18. The non-transitory computer-readable medium of claim **17**, wherein the user is associated with a profile, further comprising:

one or more instructions to prevent altering of the maximum volume level by the user based on privileges associated with the profile that prevent altering of the maximum volume level.

19. The non-transitory computer-readable medium of claim **18**, wherein the user is a first user and the profile is a first profile, further comprising:

one or more instructions to allow altering of the maximum volume level by a second user based on privileges associated with a second profile that allow altering of the maximum volume level.

20. The non-transitory computer-readable medium of claim **15**, wherein each of the sets of rules includes a time frame during which the corresponding preset volume setting applies.

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